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ABSTRACT

The BUILD Program (Businesses United to Increase Literacy Development) was conducted from June 1991 through December 1992 as a cooperative workplace literacy program joining Arapahoe Community College and four companies in Littleton, Colorado. This document consists of two modules for the mathematics (computation) classes of the program. The first module, "Workplace Learning Skills," by Jennifer Burkhart, contains four lessons that cover the following: a pretest (from the General Educational Development mathematics book), calculators in the workplace, parts of the whole, and graphs and charts of quality control. Lessons include an objective, required materials, allotted time, outlines of activities with instructor's notes, appendixes containing handouts or transparency masters of practice computations, and individual student activities. The second module, by Mark Sullivan, contains three lessons for instruction in computation in English as a Second Language. Topics are whole numbers, basic mathematical functions, and the national debt. Lesson plans include an objective, required materials, time allotted, and activities. Worksheets are provided in an appendix. (KC)

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COMPUTATION

WORKPLACE EDUCATION PROGRAM CURRICULUM

Arapahoe Community College

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Computation

Workplace Learning

Skills

WORKPLACE LEARNING SKILLS
by
JENNIFER BURKHART

INTRODUCTION

The purpose of this module is to identify, demonstrate and practice various mathematical operations which are applicable to the workplace. The student will gain an appreciation of the functions of computation on the job as well as in problem solving and critical thinking. Students will practice "Learning to Learn" and "Critical Thinking" competencies throughout this module. The following is a list of target competencies included in this module:

OBJECTIVES / TARGET COMPETENCIES

- **Add, subtract, multiply, divide whole numbers, fractions and decimals**
- Round off to the nearest whole number
- **Estimate reasonable answers**
- Read and interpret simple bar, circle and line charts and graphs
- Determine equivalent fractions, decimals and percents
- Measure length, width, volume, speed and temperature
- Compute percents and rates
- Compute ratio and proportion
- Make charts with 2 variables
- Make bar, line and circle charts/graphs
- Interpret scales
- Self - study advanced computation (Optional)

Note: Critical Thinking skills il **Bold** letters
Learning to Learn skills denoted with asterisk*

APPLICATIONS IN THE WORKPLACE

- Measuring and calibrating tools
- Understanding TQM
- Reading charts and graphs
- Machine set-up
- Calculating pay / taxes
- Packing and ordering boxes
- Reading CNC machine
- Figuring tolerances
- Problem solving on the job
- Changing standard measurements to metric

MODULE CONTENT / LESSONS

MODULE: COMPUTATION

LESSON #1 - Pretest (GED Math Book)

OBJECTIVE: To further identify the skill levels of the students in order to effect individualized education programs to permit the most effective use of this module.

REQUIRED MATERIALS: GED Math Skills Book - pretest, key and competency sheet, pencil and paper.

ALLOTTED TIME: 1 to 1 1/2 Hours

ACTIVITIES:

I. **Pretest Administration**

II. **Corrections**

III. **Analysis**
The instructor or the individual students may correlate the incorrect responses on the pretest to the competency sheet to identify corresponding pages to be studied.

MODULE: COMPUTATION

LESSON #2 - Calculators - Their place in the Workplace

OBJECTIVE: To identify appropriate usages of the calculator and its signifigance in our jobs and lives in order to overcome "calculator dependency".

Note: The math module should be covered with out the use of calculators unless otherwise noted.

REQUIRED MATERIALS: Black or White board, Chalk or Marker, Pencil and Paper, Calculator for each student (preferable a statistics calculator).

ALLOTTED TIME: 30 Minutes

ACTIVITIES:

I. **Discussion:**
   A. When do you use your calculator at work?
   B. When do you use it at home?
   C. How many feel that they could perform the above situations without the calculator?
   D. How long would it take to perform the above situations without a calculator?
   E. Refer to hand out appendix 2.1
      1. Read the questions aloud to the class.
      2. Ask the students to answer each question by marking T for True and F for False
      3. Allow only 15 seconds to answer each question
      4. Review the answers as noted on appendix 2.2
      5. Discuss how the students felt. Could they have done this exercise with a calculator more easily?
      6. Why or why not?

   F. Does using a calculator run a rate of error? (Yes)

Instructor's note: You may find that there is a large discrepancy in the skill levels of your students. The discussion and exercise above should demonstrate that our dependency on the calculator has taken away a great amount of our ability to estimate and problem solve. This may be a good time to bring up that we will seldom use calculators in this class in order to diminish our dependency on the calculator.

II. **Demonstrate**

A. Review the buttons as listed on appendix 2.3.

1. On/c - Use to turn on the calculator or to clear the a mistaken entry (i.e. If you want to add 3 + 4 and accidentally push 5, hit the on/c button to clear the 5)
2. **Off** - Use to turn the calculator off.
3. ÷ - Use to divide one number by another.
4. **x** - Use to multiply one number by another.
5. **-** - Use to subtract one number from another.
6. **+** - Use to add numbers
7. **=** - After entering the numbers and chosen operation, push this key to receive the answer.
8. **+/-** - Use this key to perform operations with positive and negative numbers.
9. **INV** - Use this key to change from the upper operation on a button to the lower operation on a button.
10. **k**- Use this as a constant key. This stores a number and its associated operation for repetitive calculations. Enter the number, then the operation, then press **k**.
11. Σ+/− – Use this key in statistical operations to find mean, variance and standard deviation.
12. **sto** - Use this button to store the displayed quantity in the memory without removing it from the display. Any previous value you have stored in the memory is replaced by the new entry.
13. **rcl** - Use this button to recall the contents of the memory into the display without affecting the content of the memory.
14. **sum** - Use this button to add the display value to the memory content. This key does not affect the diplayed number or calculations in progress.

15. **exc** - Use this button to swap the content of the memory with the display value. The display value is stored and the previously stored value is diplayed.

16. **x** - Use this button to find the mean of the data entered.

B. Ask students to look at their calculators and find keys with which they are not familiar. What math operations do they do on the job? Is there any which we could now do on the calculator.

III. **Review:**

A. Ask for any questions.

B. Try to have the class come to an agreement that we need to focus on using our minds in this module and not the calculator.

MODULE: COMPUTATION

LESSON #3 - Parts of the Whole

OBJECTIVE: To identify, demonstrate and practice using parts of the whole (fractions, decimals and percents) in basic math operations to promote a stronger understanding of their functions in the workplace.

REQUIRED MATERIALS: Black or White board, Chalk or Marker, Pencil and Paper, Appendices 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11

ALLOTTED TIME: 4 to 6 Hours

I. **Discussion:**
   A. Ask the students the following questions:
      1. What is a fraction?
      2. What is a decimal?
      3. What is a percent?
      4. Why do we have them in math?
      5. Whre do we use them at work?
   B. Ask the students to come up with a problem for each (fraction, decimals and percents) pertaining to the workplace.

Instructor's Note: There are many answers to the above; however, we are trying to bring about that the above denote a part of the whole.

II. **Demonstrate:** (Fractions, Decimals and Percents)
   A. Fractions:
      1. **Introduction**: Any quantity less than unity is a fraction. More simply stated, a fraction is an expression for a number which is less than the a whole. For example, if you ate 1 part out of 8 parts of a pie, you would have eaten 1/8 of the pie. Eight

parts denotes the whole in this example and 1 denotes the quantity or part. Ask the students to draw a box and illustrate what 1/4 of the box would look like.

2. **Addition:**
   a. Addition of fractions signifies that we are adding parts of a whole together. There are certain rules that must be followed in adding fractions. These are: the denominators must be the same and the numerators are the only numbers added.
   b. Demonstrate the addition of the following:
      1. 1/3 + 1/3 = 2/3
      2. 5/4 + 3/4 = 2 (explain how this represents 2 wholes)
   c. Demonstrate the addition of the following fractions with unlike denominators.
      1. 6/8 + 2/4 = 1 1/4 (explain finding common denominators, improper fractions and reducing fractions.)
      2. 2/3 + 1/6 = 5/6

Instructor's note: Refer to the GED Math book for further information on the addition of fractions.

3. **Subtraction:**
   a. Subtraction of fractions signifies that we are subtracting parts of a whole from each other. There are certain rules that must be followed in subtracting fractions. These are: the denominators must be the same and the numerators are the only numbers subtracted.

b. Demonstrate the subtractions of the following:
   1. 2/3 - 1/3 = 1/3
   2. 5/4 - 3/4 = 1/2 (explain reducing fractions.)

c. Demonstrate the subtraction of the following fractions with unlike denominators.
   1. 6/8 - 2/4 = 1/4 (explain finding common denominators, improper fractions and reducing fractions.)
   2. 2/3 - 1/6 = 3/6

Instructor's note: Refer to the GED Math book for further information on the subtraction of fractions.

3. **Multiplication:**

a. Multiplying fractions is very simple. Unlike adding and subtracting fractions, you need not be concerned with common denominators, but rather multiply the numerators and the denominators.

b. Demonstrate the following:
   1. 5/8 x 3/4 = 15/32
   2. 1 3/4 x 2 4/7 = 2 12/28 = 2 3/7

Instructor's note: Refer to the GED Math book for further information on the multiplication of fractions.

4. **Division:**

a. Dividing fractions is not as easy as multiplication; however, it is very similar in the end. The key to dividing is to remember to invert the second fraction and multiply as described above.

b. Demonstrate the following:
   1. 2/3 ÷ 3/4 = 8/9
   2. 5/6 ÷ 2/3 = 1 1/4

5. **Comparing:**

a. Comparing fractions is simple once you understand how to get a common

denominator. First you must find the common denominator and compare the numerators. The largest numerator is the largest fraction. If the numerators are the same on the original fractions, you may want to decide which is larger by comparing the denominators. The smaller denominator is the larger fraction.

b. Demonstrate the following:

1. 11/15 and 2/5 = 11/15 and 6/15
   Largest = 11/15

2. 1/99 and 1/100
   Largest = 1/99

B. Decimals:

1. **Introduction**: decimals are simply another way of writing a fraction; however, instead of having a denominator the part is denoted with a decimal point. Each digit to the right of the decimal point denotes a multiple of 10. For example, .02 is another way of writing 2/100. It is important to keep the decimal point in the correct space. One of the most common errors comes from a misplaced decimal.

2. **Addition and Subtraction:**

a. Addition and Subtraction of decimals is simple. There is one rule to keep in mind. While adding or subtracting the decimals it is necessary to keep the decimals in alignment. Bring the decimal straight down in the answer.

b. Demonstrate the following:

3.567	.642
+	+
4.987	.4979
8.554	1.1399

3. **Multiplication:**

In multiplying decimals you do not align the decimals, but rather multiply as if there was no decimal. When you have found the answer you must then add the decimal. Count the number of spaces located behind all the

decimals in the problem and then count that number of spaces from the right to the left in the answer. For example:

7.45	.365
x	x
.02	6.0
.149	2.19

4. **Division:**

In dividing decimals you must keep a few things in mind. If the number you are dividing into has a decimal, bring the decimal straight up in long division. If there is a decimal in the number you are dividing by (the divisor) you must move that decimal all the way to the right of the number. Additionally, you must move the decimal in the number you are dividing into to the right the same amount of spaces you moved the divisor.
For example:

5. **Comparing:**

In comparing decimals you only need look at the numerical values and the amount of spaces each contains. For example:
.456 and .567 - The larger is that with the larger number in the first place (as the place holding numbers are the same - 3).

.456 and .4562 - Compare the numbers until you find a difference. This one has an extra digit. To compare the two we will add a place holder (0) and compare the difference - 2 is larger than 0; therefore .4562 is larger.

.465 and .456 - Obviously the first is larger because the second digit of the first is greater than that of the second.

C. Percentages:

1. **Introduction:** A percentage represents another part of the whole. However; in percentages the whole will always be 100 (therefore the word percent. For example, 20% is equal to 20/100 or 1/5.

2. **Addition, subtraction, multiplication and division**

   The above operations are performed the same as when perfomed with whole numbers except that a percent (%) sign follows the answer.

3. **Comparing Percentages**

   Comparing percentages is the same as comparing whole numbers. The larger the number the greater the amount.

D. **Changing Fractions to Decimals, Decimals to Percentages, Percentages to Decimals and Decimals to Fractions:**

1. Fractions to decimals: To change a fraction to a decimal, divide the numerator by the denominator.
   5/6 = 5÷6 = 8.33333

2. Decimals to Percentages: To change a decimal to a percent, move the decimal point to the hundredths place and add a % sign.

3. Percentages to Decimals: To change a percentage to a decimal simply move the decimal point two spaces to the left. (if there is no decimal point such as with a whole number, add one to the end of the number (e.g. 50 = 50. = .5).

4. Decimals to Fractions: To change a decimal to a fraction, count the number of place holders present and put it of the appropriate multiple of 10 and reduce. For example: .025 = 25/1000 = 1/40.

III. **Practice:**

A. Handout appendices 3.1 - 3.11

B. Allow the students to work alone or in groups in completing these handouts.

C. Work with the students with questions and review if necessary with the entire class.

D. Correct the handouts as a class and review the trouble areas.

E. Note: These handouts may be used at the completion of each section above (fractions, decimals and percentages) **There are no handouts for percents as the concepts are the same with whole numbers**

IV. **Review:**

Have each student read the question that they wrote at the beginning of class to the class and ask the students to solve each one. Review problem areas.

MODULE: COMPUTATION

LESSON #4 - Graphs and charts of Quality Control

OBJECTIVE: To identify the use of graphs and charts to show and maximize quality of products, and to promote team work, problem solving and critical thinking skills.

REQUIRED MATERIALS: White or Black board, Marker or Chalk, Pencil and paper, Appendices 4.1, 4.2, 4.3, 4.4, 4.5, 4.6.

ALLOTTED TIME: 1 - 2 Hours

ACTIVITIES:

I. **Discussion**

A. Statistical Capability Study - What is it?

1. Hand out and review appendix 4.1.
2. If this bell curve shows an acceptable product is being produced, what does the bell curve in appendix 4.2 show? (Hand out appendix 4.2)
3. What could be some solutions to the problem if your bell curves look like appendix 4.2 and you would like it to look like 4.1?

Instructor's note: We are looking for implementing a quality control program which utilizes some form of measuring conformance.

4. Explain that there are many types of QC programs. What we'll be looking at is a Statistical Process Control chart.

II. **Practice**

A. Explain that the importance of this chart is to maintain a quality product and to catch non-conforming products as soon as possible.

B. Hand out appendix 4.3 and 4.4. Explain that this is a sample SPC chart and it's terminology. In the overall picture of Quality, this or another type of SPC chart may be what they will see and use to maintain quality.

C. In groups of 3-4 students, ask the students to find the sum, average and range of all the subgroups and compare these with other team members'. Then using the information on the terminology sheet, complete the equations below.

Instructor's note: This might take a lot of time - you might want to do this as a class to help guide the students. Regardless of the procedure, be available to help.

D. Once everyone is done, review this example as a class.

E. Correct and rework the problem areas as a class.

Instructor's note: By allowing the students to complete this in groups, you are allowing the students to practice team building, problem solving and critical thinking skills. Some resistance may build throughout this exercise as students become frustrated.

F. Once the answers have been agreed upon, have the students fill out the chart by plotting the Upper and Lower Control Limits and each subgroup average measurement. Connect these dots with a straight edge and ask the students if they feel this part is running well according to the chart. (Appendix 4.6)

III. **Review:** Review any questions.

Appendices

Workplace Learning

Skills

Appendix 2.1

ESTIMATION

Directions: Answer the following questions by marking T for true and F for false. Do not take more than 10 seconds answering any one question. Do not use a calculator.

1. T or F 75% of 120 = 90

2. T or F 20% of 50 = 15

3. T or F .35 + .92 = 1.27

4. T or F 1/6 + 7/6 = 1 1/3

Appendix 2.2

ESTIMATION

Directions: Answer the following questions by marking T for true and F for false. Do not take more than 10 seconds answering any one question. Do not use a calculator.

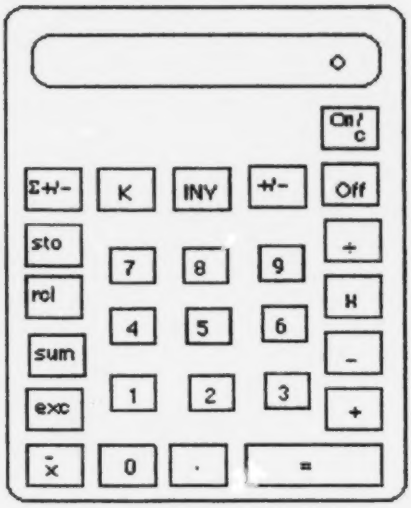
1. T or F 75% of 120 = 90

2. T or F 20% of 50 = 15

3 T of F .35 + .92 = 1.27

4. T or F 1/6 + 7/6 = 1 1/3

Appendix 2.3



Appendix 3.1

ADDING FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of adding fractions that were covered in class. Reduce your answers.

1. 1/5 + 3/10 =

2. 1/7 + 5/6 =

3. 1/3 + 2/5 =

4. 1/4 + 2/5 =

5. 1/2 + 1/4 =

6. 1/8 + 2/3 =

7. 1/2 + 1/3 =

8. 1/5 + 3/10 =

9. 3/11 + 4/9 =

10. 1/6 + 3/8 =

11. 2/7 + 2/13 =

12. 1/9 + 1/7 =

13. 1/3 + 3/11 =

14. 1/4 + 4/9 =

15. 1/3 + 6/11 =

ADDING FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of adding fractions that were covered in class. Reduce your answers.

1. 1/5 + 3/10 = 1/2
2. 1/7 + 5/6 = 41/42
3. 1/3 + 2/5 = 11/15
4. 1/4 + 2/5 = 13/20
5. 1/2 + 1/4 = 3/4
6. 1/8 + 2/3 = 19/24
7. 1/2 + 1/3 = 5/6
8. 1/5 + 3/10 = 1/2
9. 3/11 + 4/9 = 71/99
10. 1/6 + 3/8 = 13/24
11. 2/7 + 2/13 = 40/91
12. 1/9 + 1/7 = 16/63
13. 1/3 + 3/11 = 20/33
14. 1/4 + 4/9 = 25/36
15. 1/3 + 6/11 = 17/33

Appendix 3.2

SUBTRACTION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of subtracting fractions that were covered in class. Reduce your answers.

1. 7/9 - 2/5 =
2. 5/8 - 1/2 =
3. 12/13 - 1/4 =
4. 3/4 - 1/8 =
5. 1/2 - 1/3 =
6. 7/8 - 2/5 =
7. 6/7 - 1/3 =
8. 9/10 - 1/9 =
9. 11/12 - 1/5 =
10. 7/8 - 1/5 =
11. 5/7 - 1/3 =
12. 11/13 - 1/4 =
13. 4/9 - 1/5 =
14. 7/10 - 2/5 =
15. 4/5 - 1/7 =

SUBTRACTION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of subtracting fractions that were covered in class. Reduce your answers.

1. 7/9 - 2/5 = 17/45
2. 5/8 - 1/2 = 1/8
3. 12/13 - 1/4 = 35/52
4. 3/4 - 1/8 = 5/8
5. 1/2 - 1/3 = 1/6
6. 7/8 - 2/5 = 19/40
7. 6/7 - 1/3 = 11/21
8. 9/10 - 1/9 = 71/90
9. 11/12 - 1/5 = 43/60
10. 7/8 - 1/5 = 27/40
11. 5/7 - 1/3 = 8/21
12. 11/13 - 1/4 = 33/52
13. 4/9 - 1/5 = 11/45
14. 7/10 - 2/5 = 3/10
15. 4/5 - 1/7 = 23/35

Appendix 3.3

MULTIPLICATION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of multiplying fractions that were covered in class. Reduce your answers.

1. 9/10 x 1/2 =
2. 3/4 x 2/3 =
3. 5/6 x 6/7 =
4. 1/2 x 1/7 =
5. 2/3 x 5/7 =
6. 7/8 x 4/9 =
7. 1/9 x 1/8 =
8. 3/7 x 4/9 =
9. 9/11 x 7/10 =
10. 4/9 x 7/9 =
11. 1/8 x 5/6 =
12. 1/7 x 3/7 =
13. 6/7 x 2/3 =
14. 1/3 x 1/2 =
15. 1/4 x 1/4 =

MULTIPLICATION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of multiplying fractions that were covered in class. Reduce your answers.

1. 9/10 x 1/2 = 9/20
2. 3/4 x 2/3 = 1/2
3. 5/6 x 6/7 = 15/21
4. 1/2 x 1/7 = 1/14
5. 2/3 x 5/7 = 10/21
6. 7/8 x 4/9 = 7/18
7. 1/9 x 1/8 = 1/72
8. 3/7 x 4/9 = 4/21
9. 9/11 x 7/10 = 63/121
10. 4/9 x 7/9 = 28/81
11. 1/8 x 5/6 = 5/48
12. 1/7 x 3/7 = 3/49
13. 6/7 x 2/3 = 12/21
14. 1/3 x 1/2 = 1/6
15. 1/4 x 1/4 = 1/8

Appendix 3.4

DIVISION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of dividing fractions that were covered in class. Reduce your answers.

1. 1/3 ÷ 1/2 =
2. 7/9 ÷ 6/7 =
3. 3/8 ÷ 2/3 =
4. 4/7 ÷ 9/10 =
5. 6/7 ÷ 1/4 =
6. 2/3 ÷ 2/5 =
7. 9/10 ÷ 1/5 =
8. 1/4 ÷ 5/6 =
9. 2/5 ÷ 3/13 =
10. 1/5 ÷ 7/8 =
11. 5/6 ÷ 4/5 =
12. 3/13 ÷ 4/9 =
13. 4/5 ÷ 4/5 =
14. 7/8 ÷ 1/3 =
15. 4/9 ÷ 3/8 =

DIVISION OF FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of dividing fractions that were covered in class. Reduce your answers.

1. 1/3 ÷ 1/2 = 2/3
2. 7/9 ÷ 6/7 = 49/54
3. 3/8 ÷ 2/3 = 9/16
4. 4/7 ÷ 9/10 = 40/63
5. 6/7 ÷ 1/4 = 3 3/7
6. 2/3 ÷ 2/5 = 1 2/3
7. 9/10 ÷ 1/5 = 4 1/2
8. 1/4 ÷ 5/6 = 3/10
9. 2/5 ÷ 3/13 = 1 11/15
10. 1/5 ÷ 7/8 = 8/35
11. 5/6 ÷ 4/5 = 1 1/24
12. 3/13 ÷ 4/9 = 27/52
13. 4/5 ÷ 4/5 = 1
14. 7/8 ÷ 1/3 = 2 5/8
15. 4/9 ÷ 3/8 = 1 5/27

Appendix 3.5

COMPARING FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of comparing fractions that were covered in class. Circle the largest fraction.

1. 2/3 - 3/4
2. 1/4 - 3/8
3. 5/8 - 10/16
4. 4/5 - 2/3
5. 6/7 - 13/14
6. 1/8 - 3/16
7. 4/9 - 9/19
8. 7/17 - 14/33
9. 6/11 - 8/16
10. 15/16 - 33/32
11. 11/8 - 5/4
12. 7/8 - 31/32
13. 12/13 - 20/39
14. 7/8 - 15/16
15. 9/100 - 1/10
16. 1/99 - 1/100

COMPARING FRACTIONS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of comparing fractions that were covered in class. Circle the largest fraction.

1. 2/3 - 3/4
2. 1/4 - 3/8
3. 5/8 - 10/16 =
4. 4/5 - 2/3
5. 6/7 - 13/14
6. 1/8 - 3/16
7. 4/9 - 9/19
8. 7/17 - 14/33
9. 6/11 - 8/16
10. 15/16 - 33/32
11. 11/8 - 5/4
12. 7/8 - 31/32
13. 12/13 - 20/39
14. 7/8 - 15/16
15. 9/100 - 1/10
16. 1/99 - 1/100

Appendix 3.6

ADDITION OF DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of adding decimals that were covered in class.

1. 51.8 + 67.4 + 9.32 =
2. 16.75 + 9.88 + 2.63 =
3. .08 + 11.22 + 5.16 =
4. 367 + 14.91 + 30.33 =
5. 11.9 = 2.77 + 111.12 =
6. 74.2 + 3.944 + 36.42 =
7. 11.49 + 126.7 + 1.34 =
8. 7.67 + 39.2 + 38.4 =
9. .099 + 44.4 + 8.63 =
10. 86.3 + 75.5 + 5.67 =
11. 68.3 + 1.4 + 12 =
12. 9.47 + 62 + 1.1 =
13. 47.9 + 4.90 + 19 =
14. 109 + 55 + 8.2 =
15. 6.42 + 1.1 + 36 =

ADDITION OF DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of adding decimals that were covered in class.

1. 51.8 + 67.4 + 9.32 = 128.52
2. 16.75 + 9.88 + 2.63 = 20.368
3. .08 + 11.22 + 5.16 = 16.46
4. 367 + 14.91 + 30.33 = 412.24
5. 11.9 = 2.77 + 111.12 = 125.79
6. 74.2 + 3.944 + 36.42 = 114.564
7. 11.49 + 126.7 + 1.34 = 139.53
8. 7.67 + 39.2 + 38.4 = 85.27
9. .099 + 44.4 + 8.63 = 53.129
10. 86.3 + 75.5 + 5.67 = 167.47
11. 68.3 + 1.4 + 12 = 81.7
12. 9.47 + 62 + 1.1 = 72.57
13. 47.9 + 4.90 + 19 = 71.8
14. 109 + 55 + 8.2 = 172.2
15. 6.42 + 1.1 + 36 = 43.52

Appendix 3.7

SUBTRACTING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of subtracting decimals that were covered in class.

1. 114.5 - 16.33 =
2. 42.5 - 3.77 =
3. 61.5 - 39.8 =
4. 7.11 - 4.92 =
5. 143 - 98.275 =
6. 69.4 - 39.59 =
7. 8.86 - .899 =
8. 91.2 - 42.77 =
9. 21.7 - 3.15 =
10. 33.6 - 7.49 =
11. 84.2 - 48.4 =
12. 71.4 - 63.2 =
13. 61.9 - 6.91 =
14. 5.56 - .517 =
15. 65.8 - 43.82 =

SUBTRACTING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of subtracting decimals that were covered in class.

1. 114.5 - 16.33 = 98.17
2. 42.5 - 3.77 =38.73
3. 61.5 - 39.8 =21.7
4. 7.11 - 4.92 = 2.19
5. 143 - 98.275 =44.725
6. 69.4 - 39.59 = 29.81
7. 8.86 - .899 = 7.961
8. 91.2 - 42.77 = 48.43
9. 21.7 - 3.15 = 18.55
10. 33.6 - 7.49 = 26.11
11. 84.2 - 48.4 = 35.8
12. 71.4 - 63.2 = 8.2
13. 61.9 - 6.91 =54.99
14. 5.56 - .517 = 5.043
15. 65.8 - 43.82 = 21.98

Appendix 3.8

MULTIPLYING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of multiplying decimals that were covered in class.

1. .25 x .25 =
2. 6.2 x 2.3 =
3. 2.34 x 3.1 =
4. 3.1 x 5.7 =
5. 9.2 x 4.3 =
6. 2.4 x 2.3 =
7. 4.3 x 2.1 =
8. 9.9 x 6.4 =
9. 4.6 x 51.01 =
10. 7.01 x 5.2 =
11. 912.2 x .413 =
12. 8.62 x 1.7 =
13. 4.9 x 6.3 =
14. 7.2 x 1.1 =
15. 14.4 x 1.2 =

MULTIPLYING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of multiplying decimals that were covered in class.

1. .25 x .25 = .0625
2. 6.2 x 2.3 = 14.26
3. 2.34 x 3.1 = 7.254
4. 3.1 x 5.7 = 17.67
5. 9.2 x 4.3 = 39.56
6. 2.4 x 2.3 = 5.52
7. 4.3 x 2.1 =9.03
8. 9.9 x 6.4 =63.36
9. 4.6 x 51.01 = 234.646
10. 7.01 x 5.2 = 36.452
11. 912.2 x .413 = 376.7386
12. 8.62 x 1.7 = 14.654
13. 4.9 x 6.3 = 30.87
14. 7.2 x 1.1 = 7.92
15. 14.4 x 1.2 = 17.28

Appendix 3.9

DIVIDING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of dividing decimals that were covered in class.

1. 12 ÷ 24 =
2. 4 ÷ 5.0 =
3. 1 ÷ 100 =
4. .384 ÷ 4 =
5. 7 ÷ 10.0 =
6. 6 ÷ 12 =
7. 85 ÷ .15 =
8. 300 ÷ .1 =
9. 8.1 ÷ .9 =
10. 5 ÷ .25 =
11. 72 ÷ .08 =
12. 4.24 ÷ .006 =

DIVIDING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of dividing decimals that were covered in class.

1. 12 ÷ 24 = .5
2. 4 ÷ 5.0 = .8
3. 1 ÷ 100 = .01
4. .384 ÷ 4 = .096
5. 7 ÷ 10.0 = .7
6. 6 ÷ 12 = .5
7. 85 ÷ .15 =566.667
8. 300 ÷ .1 = 3000
9. 8.1 ÷ .9 = 9
10. 5 ÷ .25 = 20
11. 72 ÷ .08 = 900
12. 4.24 ÷ .006 = 706.6667

Appendix 3.10

COMPARING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of comparing decimals that were covered in class. Circle the largest decimal.

1. 17.982 - 18.792
2. .094 - .095
3. 16.667 - 16.668
4. 32.49 - 33.01
5. 47.78 - 46.79
6. 357.01 - 356.99
7. .19998 - .19989
8. 137.55 - 137.555
9. 443.88 - 443.89
10. .256 - .265
11. 9.88 - 9.98
12. 16.4 - 16.45
13. 39.9 - 39.99
14. 26.6 - 26.79
15. 152.3 - 153.2

COMPARING DECIMALS

Directions: Complete the following problems and review them with you instructor. Remember to refer to the rules of comparing decimals that were covered in class. Circle the largest decimal.

1. 17.982 - 18.792
2. .094 - .095
3. 16.667 - 16.668
4. 32.49 - 33.01
5. 47.78 - 46.79
6. 357.01 - 356.99
7. .19998 - .19989
8. 137.55 - 137.555
9. 443.88 - 443.89
10. .256 - .265
11. 9.88 - 9.98
12. 16.4 - 16.45
13. 39.9 - 39.99
14. 26.6 - 26.79
15. 152.3 - 153.2

Appendix 3.11
Fill in the blanks.

- -	.5	- -
2/3	- -	66.67%
- -	.375	37.5%
5/32	- -	15.6%
- -	.563	- -
3/64	- -	4.6875%
- -	.438	43.8%
2/125	- -	- -
- -	1.2	- -
9/20	.45	- -
7/100	- -	7%
- -	.28125	28.125%
- -	.42	- -
687/1000	- -	68.7%
- -	- -	40.625%

Appendix 3.11 - pg 2
Fill in the blanks.

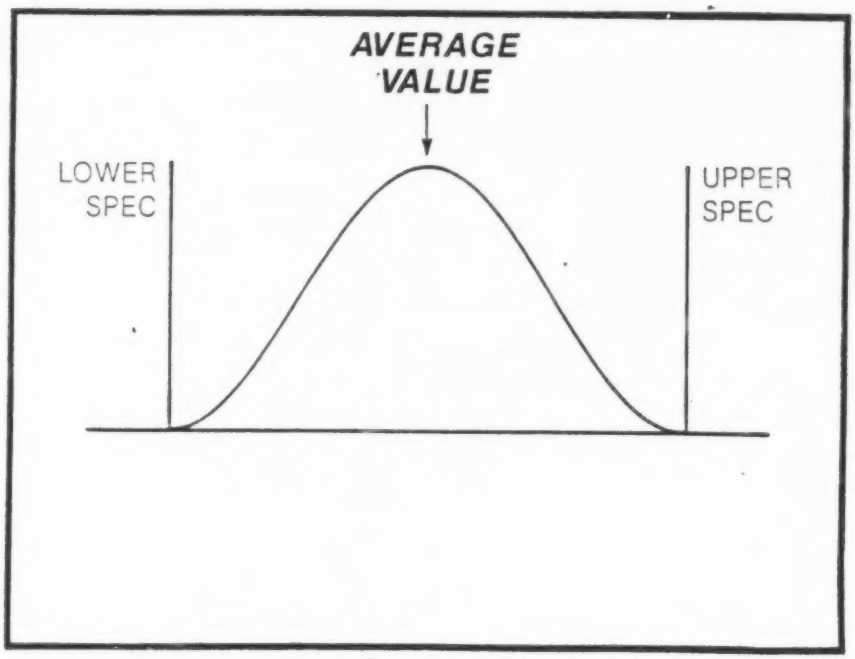
1/2	.5	50%
2/3	.6667	66.67%
3/8	.375	37.5%
5/32	.156	15.6%
9/16	.563	56.3%
3/64	.046875	4.6875%
219/500	.438	43.8%
2/125	.016	1.6%
1 1/5	1.2	120%
9/20	.45	45%
7/100	.07	7%
9/32	.28125	28.125%
21/50	.42	42%
687/1000	.687	68.7%
13/32	.40625	40.625%

Statistical Capability Study

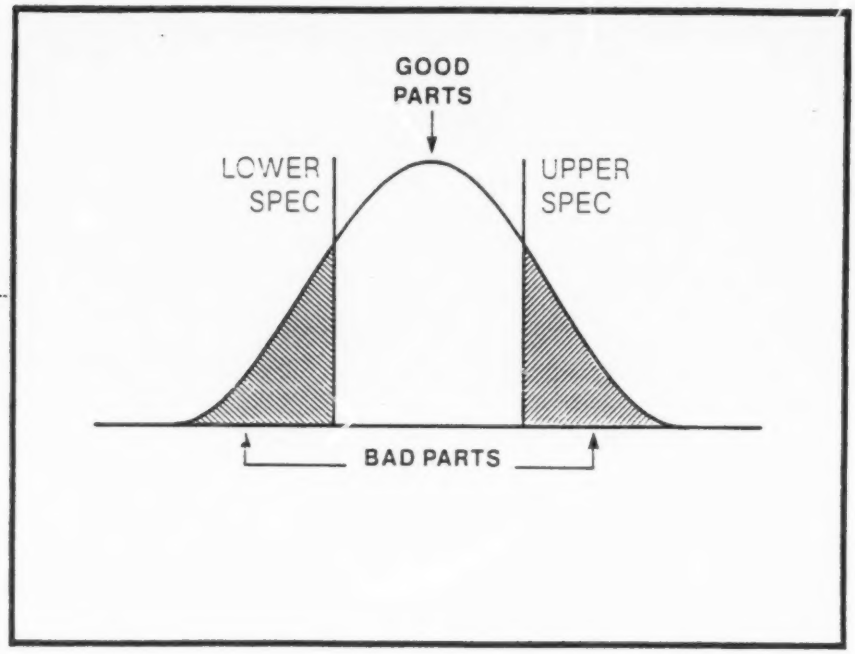
A statistical capability study is a five-step procedure:

1) collect product measurements
2) mathematically manipulate measurement data to determine process variability
3) define upper and lower limits for acceptable product
4) analyze your data
5) correct the production process

Data used in step 2 should produce a bell curve that peaks at the average measurement value. As you analyze the data (step 4), you are consistently producing good product if the curve falls within the upper and lower limits you have set.



If, however, your curve looks more like the one in the figure below, some corrective steps must be taken. One thing you could do is adapt a new approach to quality—Total Quality Control.



Sample SPC Chart Terminology
Variables Control Chart

1. n = Sample size
2. k = Number of Subgroups
3. $\bar{X}$ = Average
4. R = Range
5. Σ = Sum of
6. $UCL_{\bar{X}}$ = Upper Control Limit of Averages
7. $LCL_{\bar{X}}$ = Lower Control Limit of Averages
8. UCL_R = Upper Control Limit of Ranges
9. LCL_R = Lower Control Limit of Ranges
10. Constant = Unchanging numerical value charted for different sample sizes (n).

SPC

SAMPLE

SAMPLE SIZE (n) 5	SAMPLE FREQUENCY 4.5 HRS.		JOB NO. FLOOR		DEPT. 821		
PART NO. 11-113-100	CHART NO. 1		PART/ASM. NAME PIPE PLUG				
CHARACTERISTIC BREAKAWAY TORQUE		OPERATION 03	SPECIFICATION LIMITS 60196 INLBS				
MACHINE NO. 16T805007	GAUGE TORQUE WRENCH		UNIT OF MEASURE INLBS		ZERO EQUALS NA		
TARGET DIMENSION 78.0							
DATE							
TIME							
(n)	1	79.9	87.4	86.8	75.9	69.5	84.7
	2	81.1	81.2	81.6	89.8	90.6	75.9
SAMPLE MEASUREMENTS	3	86.0	77.4	81.5	87.8	82.4	75.7
	4	84.2	84.1	74.7	80.1	85.4	85.3
	5	78.9	77.8	81.1	68.4	87.3	77.4
	6						
SUM							
AVERAGE $\bar{X}$							
RANGE R							

CONTROL LIMIT CALCULATIONS

CONTROL LIMITS

NUMBER OF SUBGROUPS, k = 6

$\bar{\bar{X}} = \Sigma \bar{X} / k$ = ____ ÷ ____ = ____

$\bar{R} = \Sigma R / k$ = ____ ÷ ____ = ____

$A_2 \bar{R}$ = ____ x ____ = ____

$UCL_X = \bar{\bar{X}} + A_2 \bar{R}$ = ____ + ____ = ____

$LCL_X = \bar{\bar{X}} - A_2 \bar{R}$ = ____ - ____ = ____

$UCL_R = D_4 \bar{R}$ = ____ x ____ = ____

$LCL_R = D_3 \bar{R}$ = ____ x ____ = ____

CONSTANTS

n	A_2	D_4	d_2	D_3
2	1.880	3.268	1.128	0
3	1.023	2.574	1.693	0
4	0.729	2.282	2.059	0
5	0.577	2.114	2.326	0
6	0.483	2.004	2.534	0

SPC

SAMPLE

SAMPLE SIZE (n) 5	SAMPLE FREQUENCY 4.5 HRS.		JOB NO. FLOOR		DEPT. 821		
PART NO. 11-113-100	CHART NO. 1		PART/ASM. NAME PIPE PLUG				
CHARACTERISTIC BREAKAWAY TORQUE		OPERATION 03	SPECIFICATION LIMITS 60196 INLBS				
MACHINE NO. 16T805007	GAUGE TORQUE WRENCH		UNIT OF MEASURE INLBS		ZERO EQUALS NA		
TARGET DIMENSION 78.0							
DATE							
TIME							
SAMPLE MEASUREMENTS (n)	1	79.9	87.4	86.8	75.9	69.5	84.7
	2	81.1	81.2	81.6	89.8	90.6	75.9
	3	86.0	77.4	81.5	87.8	82.4	75.7
	4	84.2	84.1	74.7	80.1	85.4	85.3
	5	78.9	77.8	81.1	68.4	87.3	77.4
	6						
SUM		410.10	407.90	405.70	402.00	415.20	399.00
AVERAGE $\bar{X}$		82.00	81.60	81.10	80.40	83.00	79.80
RANGE R		7.10	10.00	12.10	21.40	21.10	9.60

CONTROL LIMIT CALCULATIONS

CONTROL LIMITS

NUMBER OF SUBGROUPS, k = 6

$\bar{\bar{X}} = \Sigma \bar{X}_k = 488.90 \div 6 = 81.32$

$\bar{R} = \Sigma R / k = 80.7 \div 6 = 13.45$

$A_2 \bar{R} = .577 \times 13.45 = 7.76$

$UCL_X = \bar{\bar{X}} + A_2 \bar{R} = 81.32 + 7.76 = 89.08$

$LCL_X = \bar{\bar{X}} - A_2 \bar{R} = 81.32 - 7.76 = 73.56$

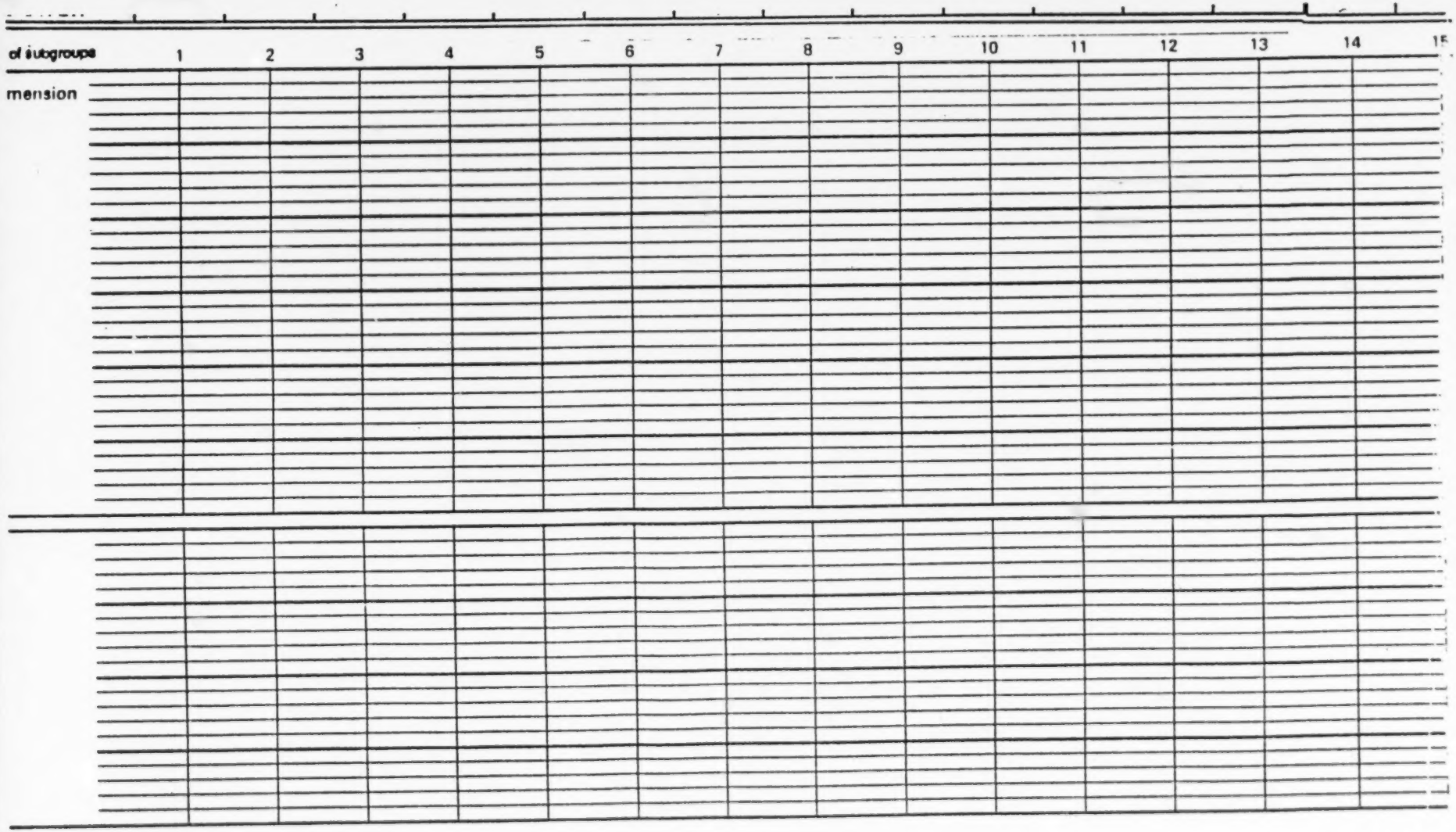
$UCL_R = D_4 \bar{R} = 2.114 \times 13.45 = 28.43$

$LCL_R = D_3 \bar{R} = 0 \times 13.45 = 0$

Appwndix 4.5

CONSTANTS

n	A_2	D_4	d_2	D_3
2	1.880	3.268	1.128	0
3	1.023	2.574	1.693	0
4	0.729	2.282	2.059	0
5	0.577	2.114	2.326	0
6	0.483	2.004	2.534	0


of subgroups
1
2
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mension

Individual Student

Activities

MODULE: COMPUTATION

INDIVIDUALIZED STUDENT ACTIVITIES

OBJECTIVE: To provide students with supplemental activities which focus on the areas the student would like to study in addition to the competencies covered in the Computation Lessons.

REQUIRED MATERIALS: GED Math Skills Book, Computer Access, Attachments.

ACTIVITIES:

I. Pretest Results
According to the results of the pretest given from the GED Math Skills Book, students may identify the chapters in which they would like to work.

II. Math Blaster Plus - Hewlett Packard
According to the students' skill levels, this program aids students in areas such as adding whole numbers to fractions and decimals.

III. Math Blaster Mystery - MacIntosh
This program also aids students in basic skill areas as well as focuses on solving word problems.

IV. The Merrit Programs - Hewlett Packard
This program offers the student a large assortment of activities focusing on skills from the basic to the advanced.

V. Metric Conversion Chart
This chart (attached) gives the student a systematic approach to converting U.S. Standard to metric measurements.

VI. 5 Steps to Solving Word Problems
This sheet will aid any student who works with math on the job or in life as the majority of the math problems we perform are in the form of oral word problems.

VII. For those students wanting to tease their brains a bit, the algebraic problem (attached) provides a challenge for anyone.

VIII. All students should focus on their texts for additional material.

Metric Conversion Chart (approximations)

	symbol	When you know	multiply by	to find	symbol
Length	mm	millimetres	0.04	inches	in
	cm	centimetres	0.4	inches	in
	m	metres	3.3	feet	ft
	m	metres	1.1	yards	yd
	km	kilometres	0.6	miles	mi
Area	cm^2	square centimetres	0.16	square inches	in^2
	m^2	square metres	1.2	square yards	yd^2
	km^2	square kilometres	0.4	square miles	mi^2
Mass	g	grams	0.035	ounces	oz
	kg	kilograms	2.2	pounds	lb
	t	tonnes (1000kg)	1.1	short tons	

5 Steps to Solving Word Problems

1. **Read/Listen to the entire problem.**
2. **Find the question. What is the problem asking you to find?**
3. **Choose the important facts needed to solve the problem.**
4. **Decide what arithmetic operation to use (addition, subtraction, multiplication, division).**
5. **Compute and check you answer.**

Example:

Chris works 8 hours a day. If he is asked to increase his hours to 9 per day, how many hours does he work in a 5 day work week?

1. Read the problem.
2. What is the question?

   How many hours does he work in a 5 day work week.

3. Choose the important facts.

   * If he is asked to increase his hours to 9 hours per day
   * 5 day work week

4. Choose the correct arithmetic operation.

   Addition
   Subtraction
   ✓ Multiplication
   Division

5. Compute -

   9 hours x 5 days = 45 hours

   Check-

Directions: Is this problem worked correctly? Tell me why or why not.

Given:	$a=b$
Multiply by a:	$a^2 = ab$
Subtract b^2:	$a^2-b^2 = ab-b^2$
Factor:	$(a+b)\ (a-b) = b(a-b)$
Divide by (a-b):	$a+b = b$
But a=b, ∴ :	$b+b = b$
	$2b = b$
so,	$2 = 1$

COMPUTATION
IN
ENGLISH
AS A SECOND LANGUAGE

ENGLISH AS A SECOND LANGUAGE
by
MARK SULLIVAN

COMPUTATION AND NUMBERS IN ESL

INTRODUCTION:

A large part of the English vocabulary is the number. Hence, the study of this vocabulary is an important part of the study of the language. The purpose of this module is to introduce and practice the use of numbers in the language of the workplace.

OBJECTIVE / TARGET COMPETENCIES:

* Understanding Data (charts and graphs)
* Understanding and applying symbols and abbreviations
* Using basic math
* Estimating
* Using workplace vocabulary

APPLICATIONS IN THE WORKPLACE:

* Understanding written and verbal numeric information; such as on work orders, parts sheets, gauge settings and verbal requests.
* Understanding and applying skills learned in technical training programs.

MODULE CONTENT / LESSONS:

Lesson 1: Whole Numbers

Lesson 2: Basic Math Functions

Lesson 3: The National Debt

MODULE: COMPUTATION IN ESL

Lesson 1: Whole Numbers

Objective: To familiarize the student with the vocabulary and sequence of whole numbers in the English language.

Required Materials: Appendix esl 3.1 and 3.2; multi-colored rods; chalk/dry erase board; chalk/markers.

Time Allotted: 30 minutes

Activities:

Write the numbers 1 to 10 on the board and review each with the class. Check comprehension with the rods by giving each student 10 different colored rods (be sure that everyone has the same color and number of rods). Identify the first color as the number one (teacher's choice), the second color as the number two and so on to ten. Drill the students with the rods, checking pronunciation with each student.

Introduce ordinal numbers again with the rods. Identify the #1 color as first, #2 as second and so on. Drill and check pronunciation. Write the ordinal abbreviations nest to the numbers written on the board.

Hand out esl 3.1 and give the class a few minutes to study. Instruct them that they may work together to identify the spelling of each number word, and that they may ask questions at any time. Review and debrief with esl 3.2 when the class is finished.

MODULE: COMPUTATION IN ESL

Lesson 2: Basic Math Functions

Objective: To familiarize the student with the vocabulary and methods of performing basic math functions in English.

Required Materials: Appendix esl 3.3; chalk/dry erase board; chalk/markers; multi-colored rods.

Time Allotted: 40 minutes

Activities:

Write the vocabulary from esl 3.3 on the board for review. Explain and demonstrate each function on the board first and check comprehension and pronunciation. Model addition, subtraction multiplication and division problems with whole numbers using the rods (simple problems). Then write the same problems on the board in mathematic sequence and ask the students to discover the answer to each problem themselves using the rods. As they finish, ask them to explain, using the whole number and function vocabulary, how they reached their answers.

Hand out esl 3.3 and give them a few minutes to study and ask them to read and follow the directions carefully. Review and debrief as they finish. Remember to encourage questions and students to work together on the worksheets.

MODULE: COMPUTATION IN ESL

Lesson 3: The National Debt

Objective: To familiarize students with the spelling and vocabulary of whole numbers beyond ten.

Required Materials: appendix esl 3.4; chalk/cry erase board; chalk/markers.

Time Allotted: 30 minutes

Activities:

Hand out esl 3.4 and give the students a few minutes to study the numbers and spelling. Explain while the students follow with their own papers how to read the charts. Cardinal numbers on the left, ordinal numbers on the right. Write the numbers 20, 30, 40 and so on the board and ask the students to look at their charts and give you the spelling for each. Then write 21, 32, 43, and so on and ask for the spelling again.

Draw a reasonable facsimile of a check blank on the board and write any number of dollars and cents in the number box on the right. Ask the students to tell you what the number is in English. Review the terms dollars and cents. Ask the students how to spell the number of dollars and the number of cents in the amount on the check. Write the number on the line below where you would normally write the amount. Ask a student to tell you how much they spend on food each week and write the amount in number form on the board. Ask for the spelling. Next, ask each student to write the amount that they spend on food each week on a piece of blank paper. Spell the amount. Next, ask how much they spend on food each month, write it in numbers first and then spell. Finally, ask how much they spend on food each year. Write the numbers and then spell.

Once the students feel comfortable using the charts to find the spelling of whole numbers to the thousands, introduce millions, billions and so on. Give a few examples to familiarize the group. When comfortable with that, write the number: $4,380,865,485,693.17 (the national debt as of December, 1992). Next, write the number 285,000,000 and ask the students to write the correct spelling of each number on their

papers. Tell them to work together and to watch the spelling carefully. When they are finished writing, have the class read each number aloud. Check pronunciation and comprehension. Finally, ask the group to draw a check on their papers like the one that the instructor drew on the board. Have them write the name of another person in the class on the 'pay to the order of' line, and write the amount: $1,537,145.60 in the box to the right. Tell them to spell the amount on the dollar line below the name of the student that they are writing the check to. When they are finished, tell them that this is the amount of debt that the U.S. owes, and the check is for the amount of money each american citizen over the age of 18 would owe if we had to pay the debt today. Tell them to give their check to the person to whom they wrote their check.

MODULE: COMPUTATION IN ESL

Notes to the teacher:

On completion of this module, the student should be able to perform most of the lesson material in the WLS section of this curriculum guide.

APPENDICES
FOR
COMPUTATION
IN
ENGLISH
AS A SECOND LANGUAGE

NUMBERS – WRITTEN FORMS

Practice writing these figures.

1 2 3 4 5

ONE

6 7 8 9 10

1st 2nd 3rd 4th 5th

6th 7th 8th 9th 10th

NUMBERS

Cardinal numbers are the numbers we use when we count.

1	one	3	three	5	five	7	seven	9	nine
2	two	4	four	6	six	8	eight	10	ten

Ordinal numbers are the numbers that show order in a series.

1st	first	6th	sixth
2nd	second	7th	seventh
3rd	third	8th	eighth
4th	fourth	9th	ninth
5th	fifth	10th	tenth

12. Match the **cardinal** numbers with their correct **ordinal** numbers.

Cardinal	Ordinal
one	third
two	fifth
three	eighth
four	first
five	tenth
six	second
seven	fourth
eight	seventh
nine	sixth
ten	ninth

13. Circle the **ordinal** numbers in **12** that do not end with **th.**

Name _____ Date _____

MATH CLASS

DIRECTIONS: There are fifteen math words hidden in the puzzle. Circle them. Then write them on the lines at the bottom of the page.

Example: X O (A D D) F _____ add _____

M U L T I P L Y A B D E C
A R I T H M E T I C E Q N
T D D I V I D E N E C U U
H F G H I N J K U L I A M
E M N O P U Q R M S M T E
M P T U V S W X B Y A I R
A L G E B R A Z E Z L O A
T U A B C F P E R C E N T
I S D G G E O M E T R Y O
C M D E N O M I N A T O R
S U B T R A C T P E F G H

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

NUMBERS – CORRECT SPELLING

Use this page as a spelling and pronunciation reference sheet.

one	1	first	1st	eleven	11	eleventh	11th
two	2	second	2nd	twelve	12	twelfth	12th
three	3	third	3rd	thirteen	13	thirteenth	13th
four	4	fourth	4th	fourteen	14	fourteenth	14th
five	5	fifth	5th	fifteen	15	fifteenth	15th
six	6	sixth	6th	sixteen	16	sixteenth	16th
seven	7	seventh	7th	seventeen	17	seventeenth	17th
eight	8	eighth	8th	eighteen	18	eighteenth	18th
nine	9	ninth	9th	nineteen	19	nineteenth	19th
ten	10	tenth	10th	twenty	20	twentieth	20th

twenty-one	21	twenty-first	21st
twenty-two	22	twenty-second	22nd
twenty-three	23	twenty-third	23rd
twenty-four	24	twenty-fourth	24th
twenty-five	25	twenty-fifth	25th
twenty-six	26	twenty-sixth	26th
twenty-seven	27	twenty-seventh	27th
twenty-eight	28	twenty-eighth	28th
twenty-nine	29	twenty-ninth	29th
thirty	30	thirtieth	30th
forty	40	fortieth	40th
fifty	50	fiftieth	50th
sixty	60	sixtieth	60th
seventy	70	seventieth	70th
eighty	80	eightieth	80th
ninety	90	ninetieth	90th
one hundred	100	one hundredth	100th
one thousand	1000	one thousandth	1000th